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By Carmelle Druchniak
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DURHAM, N.H. -- It's a winter light show most of us have seen, but while we may wonder why the Northern Lights glow, Kristina Lynch wonders why they dance.

The research associate professor's work at the University of New Hampshire Space Science Center focuses on the dynamics and structure of the aurora borealis, commonly known as the Northern Lights.

"I began with an interest in astronomy, and have been coming down lower in altitude ever since," says Lynch, who didn't see the Northern Lights herself until she was four years out of college. "I enjoy the elegant physics -- electrodynamics -- which controls the aurora."

Instead of looking at the chemistry in the lower atmosphere that causes the light show most of us have seen in the winter sky, Lynch examines the acceleration processes at more than 1,000 kilometers above the Earth, processes which accelerate particles into the atmosphere and create the visible displays. "An analogy would be, we study the electron beam in the TV set, not the phosphor screen," she explains.

The aurora, or Northern Lights (the counterpart seen in the Southern Hemisphere is the *aurora australis,* or Southern Lights) is driven by the interaction of the solar wind -- the Sun's "atmosphere" that travels far into space -- and the Earth's magnetosphere. Accelerated particles then collide with particles in the Earth's atmosphere. The result is visible bands of light, clearer in areas surrounding the Earth's magnetic north and south poles.

So, why *does* the aurora dance? Lynch explains: "The electric currents, which drive the particle precipitation down into the atmosphere -- and then make the light -- are subject to instabilities that make them move and curl."

The best conditions for viewing aurora is 65 to 75 degrees latitude, near and after midnight, typically 8

p.m. to dawn, often around 2 a.m. The aurora peaks in January and February, and in August. New Hampshire sky-watchers occasionally see brightly structured aurora, but locally it is more typically a diffused glow; at higher latitudes, the lights are more structured and dynamic.

At the UNH Institute for the Study of Earth, Oceans and Space, Lynch, along with Space Science Center Director Roger Arnoldy, and College of Engineering and Physical Sciences Dean Roy Torbert study the acceleration processes above the aurora by launching sounding rockets, with flights lasting a mere 20 minutes. The rockets, often launched from Poker Flat Research Range in Fairbanks, Alaska, include particle and field detectors.

"The auroral ionosphere is reachable by small sounding rockets, making it a great laboratory for plasma physics in space," Lynch explains.

Lynch, Arnoldy and Torbert took part in three rocket launches last winter, two from Poker Flat and one supervised by Arnoldy from Norway. Two more experiments are scheduled for launch in 2001.

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